

MEDICAL TRANSPORT TECHNOLOGY

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CROSS-REFERENCE TO RELATED APPLICATIONS, IF ANY

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This application is a continuation of United States Patent Application
Serial No. 10/278,187, filed October 24, 2002, which is hereby incorporated by
reference.

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STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not applicable.

REFERENCE TO A MICROFICHE APPENDIX, IF ANY

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Not applicable.

BACKGROUND OF THE INVENTION

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1. Field of the Invention.

The present invention relates, generally, to human medical devices and methods. More particularly, the invention relates to an emergency medical transport device and method. Most particularly, the invention relates to an emergency medical transport device for engaging and acquiring an injured person such as an injured athlete or accident victim who is suspected of having a neck or spinal injury, without the necessity of lifting the injured person. The apparatus and methods of this invention may be applicable to other fields such as veterinary medical, materials handling, and the like.

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2. Background Information.

The state of the art includes stretchers, gurneys and boards.

US Patent 3,418,670 issued December 31, 1968 to Morgan discloses a roller stretcher with a pair of endless belt which are wound over respective upper and lower guides. A driving mechanism rotates one of the guides so that one of the belts is moved. The belts are in frictional contact with each other whereby the non driven belt is moved by frictional contact with the driven belt. The stretcher has a complicated structure. Replacement of belts is difficult and time consuming. And, slippage can occur as a result of the frictionally coupled belts. Slippage can compromise the comfort and safety of the patient being transported.

The background art includes US Patent 3,724,005 issued April 3, 1973 to Stevens which discloses a stretcher with an endless belt-cable or chain system which utilizes a non-endless belt which is coupled at both of its ends to a non-endless cable or chain. The non-endless belt is alternately wound and unwound around drums to move a patient. The background art also includes US Patent 6,408,466B1 issued June 25, 2002 to Blotta which discloses a stretcher for the non-traumatic transport and lifting of people. It has a frame with beams with toothed bars, an inclined plate between the frame, a flexible sheet around the plate. A driving base moves the bars and causes the inclined plate to move.

This technology is believed to have significant limitations and shortcomings, including but not limited to, that they require lifting, sliding, rolling or otherwise moving an injured person onto the device for transportation.

For this and other reasons, a need exists for the present invention.

This invention provides a medical transport apparatus for an injured person which is believed to fulfil the need and to constitute an improvement over the background technology.

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BRIEF SUMMARY OF THE INVENTION

The present invention provides an apparatus and method for acquiring and transporting an injured person.

10 In one aspect, the invention provides a device or apparatus for engaging, acquiring and transporting an object, particularly a person, and most particularly an injured person comprising:

- a. a base, housing or frame having a low clearance portion;
- b. a first conveyance assembly movably connected to the base
- 15 for moving the base with respect to the ground;
- c. a second conveyance assembly movably connected to the base for moving the person with respect to the frame; and
- d. a driver mechanism for driving the conveyance assemblies.

In another aspect, the invention provides a method of acquiring and

20 transporting an object, particularly a person and most particularly an injured person, comprising the steps of:

- a. moving a base or housing having a low clearance portion so that the low clearance portion moves toward and under the person; and
- b. moving the person relative to the base.

5 Advantages and features of the invention include but are not necessarily limited to that the device and method are mechanized and substantially automated, that the device moves so that the patient remains stationary during loading, and that the device and method are easy and safe for the operator(s) and the patient. The apparatus and method do not require lifting, sliding, rolling the injured person
10 onto the device for transportation.

The features, benefits and objects of this invention will become clear to those skilled in the art by reference to the following description, claims, if any, and drawings.

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BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

Figures 1-is a perspective view of one embodiment of the medical transport apparatus of the invention.

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Figure 2 is a side elevation view of another embodiment of the medical transport apparatus.

Figure 3 is a top or plan view of the medical transport apparatus of Figure
2.

Figure 4 is an end elevation view of the medical transport apparatus of
5 Figure 2.

Figure 5 is a top view of the medical transport apparatus with portions
removed for clarity and to show internal structure.

10 Figure 6 is a side view of the medical transport apparatus showing some
internal parts.

Figure 7 is an opposite side view of the medical transport apparatus
showing some internal parts.

15 Figure 8 is an end view of the medical transport apparatus showing some
internal parts.

Figure 9 is a top view of a portion of the medical transport apparatus.

20 Figure 10 is a side view of a portion of the medical transport apparatus.

Figure 11 is an opposite side view of the portion of the medical transport apparatus shown in Figure 10.

5 Figure 12 is an end view of the portion of the medical transport apparatus shown in Figure 9.

Figure 13 is an enlarged side view of the portion of the medical transport apparatus shown in Figure 10.

10 Figure 14 is an enlarged side view of the portion of the medical transport apparatus shown in Figure 11.

Figure 15 is a top view of side chassis of the medical transport apparatus.

15 Figure 16 is a side view of one of the chassis.

Figure 17 is a side view of another chassis.

Figure 18 is an end view of the chassis.

20 Figure 19 is a top view of the chassis and handles.

Figure 20 is an end view of the chassis and handles shown in Figure 19.

Figure 21 is a top view of the belt glide bed of the medical transport apparatus.

5 Figure 22 is a side view of the belt glide bed.

Figure 23 is an end view of the belt glide bed.

Figure 24 is a bottom plan view of a portion of the medical transport
10 apparatus embodiment of Figure 1.

Figure 25 is a view of another portion of the apparatus embodiment of Figure 24.

15 Figure 26 is a view of another portion of the apparatus embodiment of Figure 25.

Figure 27 shows a portion of the drive mechanism of the apparatus
embodiments of Figures 24-26.

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Figure 28 shows an embodiment of motors of the drive mechanism of the apparatus.

Figures 29 a and b show an embodiment of the control panel of the apparatus.

Figure 30 is a schematic illustration of one embodiment of the control system of the apparatus.

DETAILED DESCRIPTION

The present invention provides an apparatus and method for engaging, acquiring and transporting an injured person. Example embodiments of the medical transport apparatus of the present invention are illustrated.

The device is mechanized and substantially automated. The device and method function by moving so that a patient remains stationary during loading. Although the description of the apparatus and method of the invention are in terms of an injured person, it is within the purview of the invention that the apparatus and process may be used with a non-injured person (for example elderly or restrained persons), animals or objects.

The benefits of the invention include, but are not necessarily limited to that the apparatus and method do not require lifting, sliding, or rolling the injured person onto the device for transportation.

Referring to **Figure 1**, one embodiment of the medical transport device 100 comprises a base or housing 110, a top belt 112, a bottom belt 113 and a handle 114. The base 110 preferably has a rectangular configuration as viewed from the top, with a front end 115 and a back end 116.

5 Referring to **Figures 2-4**, another embodiment of the medical transport device which is substantially similar to the embodiment shown in **Figure 1**. The device 10 comprises a base or housing 11, a top belt 12, a bottom belt 13 and a handle 14. The base 11 preferably has a rectangular configuration as viewed from the top, with a front end 15 and a back end 16. The base 11 has a preferred
10 approximate length of 74 in. and width of 25 in. The front end 15 has a low profile and is disposed low to the ground so that the device 10 has approximate front height of 5/8 in. The base 11 provides an incline to a height at the back end 16 of about 6 in.

The top belt 12 is operatively connected to the frame 11. The top belt 12
15 is an endless belt with a longitudinal, top travel length substantially equivalent to the length of the base 11. It is preferably constructed of a flexible, polymeric material such as a food grade nylon backed rubber belt. The top belt 12 rotates in a counterclockwise direction as viewed in **Figure 2** and at a preferred predetermined speed of approximately 0.133 feet per second. This permits
20 loading of a 6 foot tall person in approximately 45 seconds. The top belt 12 moves a patient (not shown) from the front end 15 towards the rear end 16. The bottom belt 13 also has an endless configuration and is operatively connected to the base 11. It has a longitudinal, bottom travel length of about 2/3 the length of

the base 11. The bottom belt 13 is preferably constructed of a flexible, polymeric material. The material is preferably the same as the top belt 12. The bottom belt 13 preferably has a tread pattern on its outer face for surface traction. The bottom belt 13 rotates in a clockwise direction as viewed in **Figure 2**, and preferably at a predetermined speed which is identical to that of the top belt 12 for a smooth contact loading force. Alternatively the speed can be changed to permit compression or decompression of a patient during loading. The speed may also be variable.

The bottom belt 13 engages the ground or another such surface or substrate, and moves the medical transport device 10 toward and under the patient simultaneously as the top belt 12 engages the patient and moves the patient onto the device 10. Although the patient is typically loaded head first, loading may be accomplished feet first. Unloading of a patient is accomplished by running the device 10 belts 12 and 13 in reverse. The patient is thus gently loaded and unloaded without lifting or manipulating the patient. Although the top and bottom belts 12 and 13 are shown and described as single structures, it is within the purview of the invention that they may be constructed as plural structures disposed side by side, and connected or not connected to each other.

The handles 14 a and b are connected to the base 11 and provides a means of moving the patient transport device into a position for loading and unloading a patient, and for moving the patient when he or she is disposed on the device 10. The handles 14 a and b are preferably disposed on the sides of the base 11 and extend from near the rear end 15 approximately $\frac{2}{3}$ the length of the device 10.

However, the handle 14 may have a longer length. Also, the handle 14 may have a unitary configuration and extend around the rear end 15 of the device 10. After loading of the patient, the device 10 may be lifted by one or more users to transport the patient to another location such as an ambulance, helicopter, or other emergency vehicle or craft, a clinic or a hospital. The device is preferably light in weight and constructed of light weight materials.

Referring also to **Figures 5-9**, the base or housing 11 preferably comprises a frame 18, at least two upper rollers 19 and 20, at least two lower rollers 22 and 23, and a drive mechanism 25. The rollers 19, 20, 22 and 23 in combination with the belts 12 and 13 define conveyance assemblies or mechanisms. Upper drive roller 19 is disposed proximate the rear end 16 of the apparatus 10 and arranged laterally with respect to the overall elongated apparatus 10. It has a cylindrical configuration with a predetermined diameter. Upper idler roller 20 is disposed proximate the front end 15 of the apparatus 10 and arranged laterally. It has a cylindrical configuration and a predetermined diameter less than that of the upper drive roller 19 whereby the apparatus 10 front end 15 has a low profile. Referring also to **Figure 9-12**, the inner surface of top belt 12 is wrapped around upper drive roller 19, the belt glide bed 31, and upper idler roller 20. The outer surface of top belt 12 is engaged by an upper tensioning belt 21 disposed proximate upper drive roller 19.

The inner surface of bottom belt 13 is wrapped around lower drive roller 22, lower intermediate idler rollers 24a and b, and lower front end idler roller 24. Lower drive roller 22 is disposed proximate the rear end 16 of the apparatus 10

and arranged laterally. It has a cylindrical configuration with a predetermined diameter. Lower front end idler roller 23 is disposed toward the front end 15 of the apparatus 10, a predetermined distance from the lower drive roller 22, and arranged laterally. It has a cylindrical configuration and a predetermined diameter less than that of the lower drive roller 22 whereby the apparatus 10 front end 15 has a low profile. Intermediate lower idler rollers 24 a and b are arranged laterally and parallel to each other a predetermined distance apart.

The frame 11 comprises a pair of chassis sides 29 a and b, spacers 30 a-d, and a belt glide bed 31. The frame 11 primarily provides structural support to the remaining elements of the apparatus 10. Referring also to **Figures 15-18**, the chassis sides 29 are longitudinally disposed and have a predetermined configuration and length. The chassis side configuration includes straight sides forming an incline with radius ends. Referring also to **Figures 19 and 20**, the spacers 30 have a predetermined length and are laterally disposed and connect the chassis sides 29. The spacers 30 are disposed parallel to each other a predetermined distance apart from each other. Referring also to **Figures 21-23**, belt glide bed 31 is shown. Preferably, the glide bed 31 is a unitary or one piece structure which is rigidly connected to the chassis sides 29, for example by welding or fabrication. Alternatively, the glide bed 31 may be constructed of plural pieces or may be connected to the chassis sides 29 by known fasteners. The glide bed 31 is preferably flat, but may have a contoured surface.

Also as shown in **Figures 5-8**, the upper and lower drive rollers 19 and 22, and hence the belts 12 and 13, are powered by a drive mechanism 25. Referring

also to **Figures 13 and 14**, one embodiment of the drive mechanism 25 basically comprises a battery powered motor 35, a first belt 38, and a second belt 43. Motor 35 is preferably an aviation quality, high torque motor. An exemplary motor is provided by Quantum of Minnesota, USA. Motor 35 has power shaft 36 which is connected to motor pulley 37. First belt 38 is communicatively connected to motor pulley 37 and to lower drive pulley 39. Lower drive pulley 39 is connected to and drives first gear 40. First gear 40 is communicatively connected to and drives second gear 42. Second belt 43 communicatively connects second gear 42 to third gear 44. Third gear 44 is communicatively connected to upper drive hub 45. Lower drive roller 22 is connected to lower drive hub 41 which is connected to first gear 40, which thus supplies ground transportation power to lower belt 13. Upper drive roller 19 is connected to upper drive hub 45, which thus supplies patient transportation power to upper belt 12. This drive mechanism 25 configuration permits synchronized powering of both the upper and lower belts 12 and 13 via the single motor 35. These drive mechanism 25 components are disposed internally, between the chassis sides 29 a and b of the frame 18. The drive mechanism components essentially define a transmission connecting the motor 35 to the upper and lower drive rollers 19 and 22.

Referring to **Figures 24-26**, an alternative embodiment of the apparatus 110 is shown which has a substantially similar structure and function to the apparatus 10. Elements or aspects of apparatus 110 which have a structure or function substantially similar to elements or aspects of apparatus 10 have the same numerical designation except that is a one hundred series (100) number. In other

words, for example, upper or top belt 112 in device 100 is substantially similar to top belt 12 of device 10.

Apparatus 110 has rigid, linear, lateral stabilizers 160. Referring also to **Figures 27 and 28**, drive mechanism 125 includes a battery system 164, a control circuit 165, a high torque motor 135 and a gear box 166 connected to the motor 135, both of which are covered by housing cover 170. The gear box 166 is preferably a planetary-type gear box which is connected to the motor 135 and converts the motor drive speed to a preferred drive speed of approximately 10 RPM. Gear box 166 has a drive shaft/sprocket set 171a. Shaft/sprocket set 171b is driven by drive shaft/sprocket set 171a via a pair of gears (not shown) connected to shafts 171a and b and an intermediary gear (not shown). Drive shaft sprocket/shaft set 171a is communicatively connected to roller sprocket/shaft combination 172a (coupled to lower drive roller 122) via drive chain 173a. Shaft/sprocket set 171b is coupled to roller sprocket/shaft combination 172b (coupled to upper drive roller 119) via drive chain 173b. This permits synchronized driving of the lower and upper belts 113 and 112. Alternatively, plural motors may be used or the belts may be driven at different speeds.

Figures 29 a and b show control panel 180 comprising an on/off switch 181, an actuation control lever 182 and a battery recharger receptacle 183. On/off switch 181 preferably has a built in indicator light. Actuation control lever 182 is rotatable in forward and reverse directions corresponding to forward and reverse directions for the apparatus. Lever 182 preferably automatically returns to a neutral position when released by the user. Preferably, the control system has a

lag period of a predetermined time, most preferably approximately 5 seconds, whereby when the user moves the lever the system powers up from 0 speed to the predetermined maximum speed (for example 0.133 feet per second) over the lag period. Acceleration is preferably substantially linear. Also, when the lever is released by the user, the system slowly powers down from the normal travel speed to a stop. This smooths transitions and loading, prevents sudden stops, and minimizes trauma. Preferably, the system can be suddenly stopped in an emergency by moving the lever from one direction to the opposite direction.

Figure 30 is a schematic illustration of one embodiment of control circuitry of the apparatus 10.

Although the device and method shown and described above is configured as a stretcher, it is within the purview of the invention that the device could be configured as a guernsey, for example with legs. Additionally, although the device and method are shown and described for use with respect to an injured human being, they can be used for non-injured humans, injured or non-injured animals other than humans such as in a veterinary medical setting, and non-animal objects such as in a materials handling setting.

The descriptions above and the accompanying drawings should be interpreted in the illustrative and not the limited sense. While the invention has been disclosed in connection with an embodiment or embodiments thereof, it should be understood that there may be other embodiments which fall within the scope of the invention as defined by the claims. Where a claim, if any, is expressed as a means or step for performing a specified function it is intended that

such claim be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof, including both structural equivalents and equivalent structures, material-based equivalents and equivalent materials, and act-based equivalents and equivalent acts.